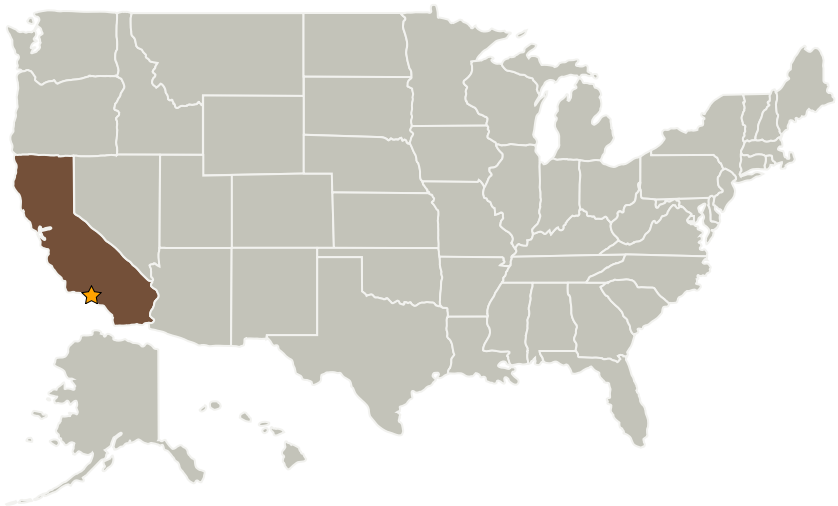
High Reflectivity, Broad-Band Silver Coating, Phase I

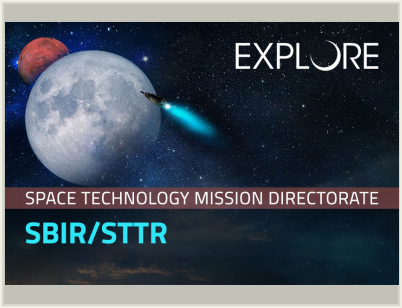
Completed Technology Project (2009 - 2009)

Project Introduction

Future space telescopes such as the Super Nova Acceleration Probe (SNAP) require exceptionally reflective coatings applied to mirrors several meters in diameter. In 2007, Surface Optics Corporation (SOC) applied a protected silver coating to the Kepler Space telescope's 1.4-m primary mirror. Although SOC's coating design met the reflectance requirements for Kepler, the protective layers absorb too much energy in the UV and visible spectral regions to meet SNAP's science objectives. In this research, SOC will improve the spectra performance of its current protected silver coating, by modifying the protection chemistry, as well as, the deposition process. SOC's silver coating design is based on a protection recipe patented by Lawrence Livermore National Laboratory (LLNL). Recent SOC IRAD results showed that significant modifications to the basic LLNL protection scheme are possible, without sacrificing coating durability. In Phase I, a variety of protective compounds will be fabricated by an ion-assisted evaporation process and optimized for their protective properties, adhesion characteristics, and effect on coating reflectivity. In addition, SOC will create a more precise method to deposit protective NiCrNx atomic clusters, which are a critical element of LLNL's silver protection recipe. By modifying SOC's evaporation system and monitoring process, it is expected the necessary volume of these highly absorbing clusters may be reduced by a factor of 2, while still providing adequate engineering margin to insure durability. These modifications will significantly improve coating reflectance in the UV and visible spectral regions. In Phase II, scale-up issues will be addressed and the improved silver coating process will be applied to a 2.2-m mirror substrate in SOC's 3.3-meter vacuum coating chamber.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Surface Optics Corporation	Supporting Organization	Industry	San Diego, California

Primary U.S. Work Locations
California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.5 Coatings